

**U.S. Environmental Protection Agency  
Science Advisory Board  
Nutrient Criteria Review Panel**

December 13-14, 2010

Washington Plaza Hotel, 10 Thomas Circle, NW, Washington, DC

**Minutes of the Meeting**

**Attendees:**

**Nutrient Criteria Panel Members:** Judy Meyer (Chair), Walter Boyton, Deborah Bronk, Piers Chapman, Robert Diaz, Anne Giblin, Kenneth Heck (by telephone), Mark Noll, Hans Paerl, Kenneth Reckhow, James Sanders (by telephone), David Schneider, Andrew Sharpley, Andrew Solow, Alan Steinman, and Jay Zieman (for full roster, see Attachment A).

**SAB Staff Office:** Stephanie Sanzone (Designated Federal Officer), Vanessa Vu, Tony Maciorowski

**Other Attendees:** See Attachment B

**Purpose:**

The purpose of the meeting was to review EPA's draft document, *Methods and Approaches for Deriving Numeric Criteria for Nitrogen/Phosphorus Pollution in Florida's Estuaries, Coastal Waters, and Southern Inland Flowing Waters*.

**Meeting Materials:**

All materials discussed at the meeting are available on the SAB Web site, <http://www.epa.gov/sab>, at the [December 13-14, 2010 Nutrient Criteria Review Panel Meeting](#) page.

**Summary of Discussions:**

The meeting was announced in the Federal Register<sup>1</sup> and proceeded according to the meeting agenda<sup>2</sup>, as revised. **Stephanie Sanzone**, Designated Federal Officer for the Panel, convened the meeting and noted that the Science Advisory Board Nutrient Criteria Review Panel (NCRP) operates in accordance with the Federal Advisory Committee Act. This means that meetings are announced and open to the public, meeting minutes are prepared, and all materials prepared for or by the Panel are available to the public. Ms. Sanzone noted that, because of weather-related flight delays and cancellations, several panel members and one public speaker would be participating in the meeting via telephone. She noted also that the Panel had received a number of public comments, which had been posted to the SAB Web site, and that nine individuals had registered in advance to provide oral comments at the meeting. **Dr. Vu**, Director of the SAB Staff Office, extended her welcome and thanks to Dr. Meyer and the other members for their participation on the panel, as well as EPA staff in attendance. **Dr. Meyer**, Chair of the Panel, gave a brief overview of the strategy for the meeting. She noted that lead discussants identified

on the agenda also would be asked to serve as lead writers for sections of the report, but emphasized that all panelists were expected to contribute to discussions and writing for all questions in the Charge to the Panel<sup>3</sup>. After brief introductions of panel members, the Chair introduced Mr. Ephraim King, Director of the Office of Science and Technology in EPA's Office of Water, for his introductory remarks.

The following is a summary of the issues discussed and conclusions reached during the meeting.

## **A. Agency Introduction and Background**

**Mr. Ephraim King**, Director of EPA's Office of Science and Technology in the Office of Water, provided the programmatic and legal context for the effort to develop numeric nutrient criteria for Florida waters (Presentation Materials<sup>4</sup>). He thanked the panel, Agency staff, and Florida presenters for participating in the meeting. Mr. King summarized the Agency's conclusion that the current Florida narrative standard can be effective but that it is time and resource-intensive to interpret the narrative criterion. The TMDL process also is quite effective, but that process is not applied to high quality waters. He noted that EPA is committed to working with Florida to develop numeric criteria based on the best available science, data and tools, consistent with the November 11, 2011 proposal deadline in the consent decree.

In response to a question from a panelist, Mr. King confirmed that downstream protection values (DPV) developed in this process would trump previously issued standards for upstream waters if the DPV are more stringent than the existing freshwater criteria.

## **B. Public Comments**

The List of Registered Speakers<sup>5</sup> included nine presenters, each of whom was allotted 8 minutes for oral comments. Ms. Sanzone noted that Mr. DeBusk would make his comments via telephone, and that Mr. Steward had notified her that he would not be making an oral statement. The comments are summarized below, in the order presented.

**Ms. Holly Greening**, Tampa Bay National Estuary Program, provided comments on approaches to relate nutrient levels to the health of seagrasses (Presentation Slides<sup>6</sup>). She described the successful application of the stressor-response approach to link nutrient load reductions to improvements in chlorophyll-*a* (Chl-*a*) and seagrass acreage in Tampa Bay. She applauded EPA's segment-specific approach to criteria, and urged that tidal creeks (which currently are grouped with estuaries) be considered separately because of their distinct ecology and functioning. For DPV, she noted that differences among tributaries (e.g., different background levels of N and P) should be considered when establishing DPV.

**Mr. Thomas Teets**, South Florida Water Management District, provided an overview of water management issues in South Florida (Presentation Slides<sup>7</sup>). He described changes in the system over time, from drainage of marshy areas in the late 1800's, to impacts of hurricanes in the 1920's, to management of water supply as saltwater from the Gulf of Mexico impacted waters in the canals. He emphasized the high degree of interaction between surface and groundwater in the region, and described the responsibilities of the South Florida Water Management District, which include flood control, water supply, navigation, and restoration (e.g., in Everglades National Park).

**Dr. Garth Redfield**, South Florida Water Management District, provided comments on the influence of water management on the ecology of South Florida canals (Presentation Slides<sup>7</sup>). He noted that there has been less focus on ecology of the canals than for the Everglades, so few data are available to develop thresholds for nutrients associated with impairments in canals. Dr. Redfield emphasized that (1) canal management is designed to meet objectives for water supply, rather than to enhance ecological values, (2) canals do not score well using invertebrate diversity measures because of physical habitat characteristics, and (3) there is a lot of variability in the relationship between nutrients and chlorophyll levels because of large differences in water flows over time. Dr. Redfield concluded that the 3 approaches being considered by EPA for canal criteria each had some science behind them, but none of them could be applied without knowing the threshold for ecological effects in canals.

**Mr. Tom DeBusk**, DB Environmental, Inc., provided comments on available data and proposed approaches to establishing nutrient criteria for South Florida canals (Presentation Slides<sup>8</sup>). While emphasizing that there were few biological data for canals, he noted that available data suggest that macroinvertebrate diversity and richness are constrained by habitat and flow characteristics, and that chlorophyll may not be an appropriate response variable for the region because flows from agricultural areas are highly colored. Data with total P and SCI (Stream Condition Index) scores show all canals as impaired, and there is only a weak relationship between chlorophyll and nutrient levels in canals.

**Mr. Daryll Joyner**, Florida Department of Environmental Protection (FDEP), summarized his written comments to the Panel<sup>9</sup>. He noted that the EPA document shares many similarities with approaches being developed in Florida, but with much less technical detail. He urged that estuarine criteria not be applied to tidal creeks, salt marshes and mangroves; that clear definitions be provided for what constitutes healthy balanced aquatic communities; and that selection of statistical methods take into account natural variability. He noted concerns with the reference condition approach, and suggested that stressor-response or water quality modeling approaches might be better, but even these have limitations. He cautioned the Agency not to oversimplify the work because of the short available time to propose criteria.

**Dr. David Tomasko**, PBS&J, urged the Agency to maintain the flexibility to set criteria as concentrations and loads. He noted that the Florida National Estuary Program (NEP) sites have set nutrient load targets because concentrations were too variable with changes in flows (rainy season, drought periods). In addition, nutrient levels are influenced by growth of epiphytes and macroalgae, septic loadings, and stormwater runoff. He noted that the WASP model used for Charlotte Harbor had over-predicted chlorophyll, and emphasized the importance of having data to calibrate the models.

**Mr. Tom Gallagher**, HydroQual, Inc., emphasized the need to define a “healthy” system, to consider how many data points and how many years of data are required (in light of year-to-year variability in flows), and to define how existing TMDLs would be converted to long-term nutrient criteria. He noted that Monte Carlo analyses might be applied to existing data, and cautioned the Agency to beware of autocorrelation from long-term concentrations computed using an empirical model.

**Dr. Tom Frazer**, University of Florida, encouraged EPA and FDEP to continue to work together on development of criteria. He expressed concerns that the EPA document oversimplifies the

number of geographic segments where distinct criteria need to be developed. Monitoring data show heterogeneity in adjacent waters, with sub-regions within estuaries having unique nutrient and chemical characteristics, and a strong latitudinal gradient in nutrient inputs. He urged EPA to consider temporal and spatial variability when defining reference condition, and agreed with the FDEP approach, using weight of evidence, to maintain current conditions. He noted the need to better define what it means to say an estuary is “in balance” or “healthy.”

### **C. Conceptual Approach**

**Tiffany Crawford**, EPA Office of Water, provided a brief overview of the conceptual approach being proposed by EPA for the development of numeric nutrient criteria for Florida estuaries, coastal waters, and southern inland flowing waters (Presentation Slides<sup>10</sup>). In response to a question from a panelist, **Dr. Dana Thomas**, EPA Office of Water, noted that EPA is deferring to the state’s assessment of whether waters are “healthy”, and that those waters are then assumed to support “balanced populations.” In response to a question from a panelist, EPA staff clarified that EPA cannot make a distinction between criteria for canals vs. streams in South Florida if the state has not distinguished between the two in setting designated uses. EPA staff also noted that the nutrient criteria would be defined to support existing dissolved oxygen (DO) criteria.

**Drs. Diaz and Giblin** led the Panel’s discussion of the conceptual model. During the discussion, Panel members made the following points:

- Each of the 3 proposed approaches has uncertainties and is likely to give different a answer, so multiple approaches should be required if data are available. EPA should provide guidance on how to select approaches and how to reconcile the results from the different approaches.
- It might be possible to take the state’s assessment of waters as impaired/unimpaired (bivariate response) under the narrative criteria and do statistical analysis to see what variables are associated with impaired vs. unimpaired waters.
- The document says TN and TP criteria will be set, but doesn’t say what actually will be measured (e.g., will TN be measured as mg/L nitrogen or mg/L nitrate?). All forms of N and P should be included.
- TN and TP are listed as causal variables, but might be response variables if N and P are tied up in algal biomass.
- The document suggests there is linear response between loading and responses, but there may be tipping points.
- The document lacks a definition of “healthy balanced flora and fauna.”
- Protection of the designated use is the objective of the criteria, but the document contains almost no discussion of how this will be assessed in quantitative terms. Biological indicators or surrogate measures are discussed, but not the values of these indicators that would be associated with healthy or unhealthy communities.
- Nutrient loads may be preferable to concentrations because there can be a temporal mismatch between nutrient concentrations and Chl-*a* because of uptake into biomass.
- The conceptual diagram includes measures of stressor, measure of exposures, and measures of response, but the document focuses almost exclusively on the measures of response.

- Protection of seagrasses likely would protect the ecosystem, particularly where data exist to relate nutrient loads to seagrass extent. Clear definition is needed of what constitutes a “healthy seagrass community.”
- For balanced phytoplankton biomass, Chl-*a* is an index of biomass, but not of community species composition, and not a measure of production (which is a rate). In many shallow systems, Chl-*a* ends up in benthic macroalgae, epiphytes etc., not just phytoplankton.
- Regression models should look at both impaired and unimpaired waters, and include explanatory variables in addition to TN and TP.
- The conceptual model should recognize that factors other than water clarity can impact seagrass colonization, and that light attenuation is impacted by more than water-column Chl-*a*.
- Some of the approaches have an overly statistical focus, not tied to reality. Hydrological variability is based on recent (vs. long term) data, assumptions of linearity are unrealistic, and it is not possible to do uncertainty analysis with these complex models.
- It may be difficult to establish coastal criteria out to 3 miles because control over nutrient inputs decreases further from shore.

#### D. Florida Estuaries

**Dr. James Hagy**, EPA National Health and Environmental Effects Laboratory (NHEERL), provided an overview of proposed methods and approaches to developing nutrient criteria for Florida estuaries (Presentation Slides<sup>11</sup>). He presented the delineation scheme, which results in 23 estuarine areas (semi-enclosed and with upper limit defined by salinity of 2.7 psu). Coastal/shelf and South Florida marine areas are delineated and addressed separately. Within estuaries, segments are defined using FDEP’s Water Body Identification (WBID) System. He summarized the availability of data and applicability of the three approaches to criteria: (1) reference condition, (2) stressor-response, and (3) water quality simulation models.

A panelist asked whether EPA’s definition of balance for phytoplankton community includes change in diversity and dominance by a few species. In response, **Dr. Hagy** noted that for the St. Johns River TMDL, the occurrence of *Macrocytis* blooms were associated with elevated levels of Chl-*a*. If this sort of relationship could be demonstrated in other areas, it could be used as an indication that the phytoplankton species composition had changed.

**Drs. Boynton** and **Paerl** led the Panel’s discussion of proposed approaches to estuarine criteria. **Dr. Heck**, participating by telephone, also provided comments. During the discussion, Panel members made the following points:

- Protection of seagrasses is an important objective, but the most important variable is water clarity at the substrate. Water clarity is influenced by CDOM, and other factors in addition to Chl-*a*.
- Epiphytes and macroalgae also are important in shading of seagrasses; managing nutrients may not improve seagrass health if grazers are no longer present to keep epiphyte levels down.
- The document does not discuss seasonal variability in nutrient loadings and concentrations (e.g., wet vs. dry, warm vs. cold seasons). How will criteria take into account hydrologic variability and droughts?

- There was concern about the time and expense of developing, and calibrating, models for many estuaries; there may not be data to establish reference condition or to do simulation modeling, and uncertainty analysis is not possible for mechanistic simulation models.
- The document should discuss in detail how the approaches would be used to derive a criterion. The relevant covariates need to be included in regressions.
- There is no discussion of how the preferred approach(es) will be selected, or of how criteria can be refined in the future using adaptive management

## E. Florida Coastal Waters

**Dr. Blake Schaeffer**, EPA Gulf Ecology Laboratory, provided an overview of the proposed approaches for developing nutrient criteria for Florida coastal waters (Presentation Slides<sup>12</sup>). He clarified that data in the draft review document are from SeaWiFS, but he noted that EPA is considering whether to also use MODIS data. He acknowledged that there are very few samples (field observations) off the Atlantic coast of Florida. In response to a question from a panelist, **Mr. Joyner** from FDEP noted that the coastal segments are based on previously existing segments developed as somewhat arbitrary assessment units for CWA303(d) reporting.

**Drs. Chapman** and **Schneider** led the Panel's discussion of proposed approaches to coastal criteria. **Dr. Sanders**, participating by telephone, also provided comments. During the discussion, Panel members made the following points:

- The proposed approach is the only practical way to monitor such a large area, but the design may not provide information on whether the sources of nutrients are onshore vs. off shore.
- The limit of 3 nautical miles for the coastal zone is an artificial boundary, so additional data points from further out might improve the strength of the correlation between remote-sensed and *in situ* measures of Chl-*a*.
- The approach relies on availability of satellite ocean color data, but delays in NASA satellite launches etc. make it important to start looking at MODIS in case it is necessary to switch sensors.
- Some of the new ocean color satellites may be less sensitive to chlorophyll, so it would be necessary to recalibrate.
- EPA proposes a chlorophyll criterion, but no measures of the stressor; how consistent is the relationship between chlorophyll levels and nutrients?
- Given the interference issues with satellite data in the near-shore zone, how will coastal data be linked to conditions in estuaries? Could turbidity measures (also available from satellite data) be used to link estuarine areas to the offshore zone? Important designated uses (e.g., fishing, swimming) occur near shore.
- Meteorology (wind and mixing regimes) also is important for interpretation of the satellite data.
- Can boundary conditions be assessed, e.g., to determine the extent of nutrient loadings from land-based sources vs. upwelling and transport-related sources?
- Consider defining coastal segments based on topography and patterns of transport (e.g., along-shore transport).

- Given historical changes (decadal and multi-decadal), ten years of satellite data may reflect present conditions rather than historical reference; the document should justify setting reference condition on this recent data.

## **F. South Florida Inland Flowing Waters**

**Dr. Jacques Oliver**, EPA Office of Water, provided an overview of nutrient criteria methods and approaches for South Florida inland flowing waters (Presentation Materials<sup>13</sup>). He noted that EPA has identified South Florida as a discrete region for this rulemaking. The region includes agricultural area, urban development, and managed and protected areas (e.g., Everglades, Loxahatchee NWR and Florida Keys). He clarified that the definition of inland flowing waters does not include wetlands, Class IV canals, tribal areas, or the Everglades Protection Area (which already has a phosphorus criterion). For inland waters, he noted that EPA is considering the reference condition and stressor-response approaches, based on 5 defined subregions. For South Florida marine waters, Dr. Oliver indicated that EPA proposes to use a reference condition approach, and that EPA may use principal component and cluster analysis to segment waters.

In response to a question from a panel member, **Dr. Oliver** acknowledged that some uses of canals (i.e., to provide flood protection, manage water quantity, and provide flows to valued ecological systems) are not expressed in the designated use, but he noted that EPA is not intending to change the state's narrative criterion or designated use. He noted also that, because of the actively managed hydrology, water quality models are not being proposed as an approach to developing canal criteria.

In response to questions from panelists, **Dr. Oliver** noted that the Landscape Development Index (LDI) and the Stream Condition Index (SCI) had been developed for streams, rather than canals. He encouraged the panel to offer advice on the applicability of these tools to canals.

**Drs. Sharpley, Solow and Steinman** led the Panel's discussion of proposed approaches to criteria for South Florida inland flowing waters. During the discussion, Panel members made the following points:

- It is not clear how reference condition can be defined for canals, given that they are very dynamic systems, built over many decades.
- Classification should consider upstream sources of water to canals, underlying soils, and the influence of groundwater connections.
- Cluster analysis is a sensible approach for classification, but the approach may be oversimplified. TN and TP both are changing over time, so it may be necessary to treat this as a multivariate problem (i.e., multiple regressions).
- When establishing reference condition, EPA needs to evaluate uncertainty, including consideration of covariates such as season and rainfall. Without knowing the distribution of nutrient values in impacted areas, the power of the approach to detect changes is not known.
- The decision to select a particular percentile of the distribution is very important to the level of protection provided by the criteria, and should be discussed in the final technical document.
- The concept of least-disturbed sites might not relate well to conditions in the canals, which may be more affected by upstream conditions than landscape conditions in the

immediate vicinity of the canal. The system plumbing may be the major driver. The canals have recreational uses (e.g., fishing), and functions could be preserved by meeting DO criterion, but without defining reference conditions as would be done for “natural” systems.

- The approach needs to reflect the influence of groundwater connectivity on surface water conditions, particularly if nutrient levels in groundwater differ from that in surface waters.

(The panel’s initial comments on the approaches for South Florida marine waters are summarized under the session on Day 2.)

## **G. Check on Progress**

Before recessing for the day, **Dr. Meyer** offered EPA personnel an opportunity to comment on the proceedings or request clarification. **Dr. Elizabeth Behl**, EPA Office of Water, expressed her appreciation to the Panel for their assistance and comments, while emphasizing that EPA is required to issue proposed criteria using the best data currently available.

The DFO recessed the meeting at 5:00 pm.

December 14, 2010:

The **DFO** reconvened the panel meeting at 8:30 a.m. **Dr. Sanders** jointed the meeting by telephone. **Dr. Meyer** reviewed the agenda for the day, noting that the schedule included time to decide on key conclusions and recommendations.

## **H. South Florida Marine Waters**

**Drs. Bronk** and **Zieman** led the Panel’s discussion of proposed approaches to criteria for South Florida Marine Waters. (**Dr. Ortman** was unable to attend the meeting.) In response to a question from a panel member, Dr. Oliver affirmed that EPA was proposing to set South Florida marine criteria based on Chl-*a*, not any direct measures of seagrass community health.

During the discussion, Panel members made the following points:

- The 3-mile boundary, described by EPA staff as coming from a Clean Water Act definition of waters of the U.S., would not include all of the reefs off of South Florida. EPA should reexamine how the 3-mile line would be drawn (e.g., around each island? from the shore baseline?)
- Many of the areas in question are marine today, but were low salinity in the past.
- The terminology “marine” is confusing; to be consistent with other parts of the document, call these waters “South Florida Estuaries and Coastal Waters”
- Statisticians on the panel will look at the public comments from Dr. Briceño regarding the z-cusum approach.
- PCA should not be used to reduce the number of variables considered.
- The reference condition approach may be comparing today’s system to that existing in about 1994, when most of the data sets begin, and missing the major changes that occurred prior to that (e.g., alteration of a free-flowing system where Florida Bay was largely a true estuary with low salinity to a highly managed system with high salinity,



altered sediment chemistry, and altered seagrass communities). The timeframe for reference condition should be specified.

- EPA should consider adding seagrass assessment endpoints, using the stressor-response approach, but bearing in mind that there are 3 types of seagrasses in the region with quite different habitat/depth requirements.
- How will (and should) the criteria factor in long-term variability, El Nino events, and climate-induced shifts in TN and TP?

## **H. Downstream Protection Values**

**Dr. Jim Hagy**, EPA NHEERL, provided an overview of proposed approaches to developing Downstream Protection Values (DPV) to protect designated uses of downstream estuaries (Presentation Slides<sup>14</sup>). He noted that DPVs would be established for terminal reaches (where tributaries empty into estuaries) and for upstream reaches to protect estuarine receiving waters. Different limiting nutrients and other factors may mean that TN and TP criteria that are protective of streams are not necessarily protective of estuaries. The proposed approach is to look at stream nutrient concentrations at the “pour point,” then look upstream using mechanistic watershed models to estimate nutrient uptake/loss during transport and estimate the fraction of nutrient load from the watershed that is attributable to each stream or stream segment. He noted various options for expressing DPV, including as flow-weighted averages. DPV for South Florida would be expressed as a load limit, rather than a concentration, because of the highly managed hydrology in the region.

**Drs. Noll and Reckhow** led the Panel’s discussion of downstream protection values. (**Dr. David** was unable to attend the meeting.) During the discussion, Panel members made the following points:

- For nitrogen-loss calculations, are empirical monitoring data available to validate the modeled loss rates? The loss rate might not be constant spatially.
- Substantial literature on phosphorus suggests that sediments can be a source OR sink for P, and that this can change with time. How would P cycling be addressed in the DPV process?
- The timeframe of the loading is important; annual loading rates tell a different story than short, episodic events that deliver a slug of nutrients (e.g., which could trigger a bloom in an estuary and negatively impact seagrasses).
- DPV seem to be expanding the criteria into allocation of load (e.g., as is being done for the Chesapeake Bay TMDL). Cost-effectiveness of load reductions would vary from place to place, and an equal distribution of load might not be the best approach.
- How are contributions of nutrients from atmospheric and other sources taken into account when determining allowable loads from streams?
- In the continuum from stream to coastal waters, there will be changes in the extent of P-limitation vs. N-limitation. The approach needs to be able to accommodate the dual-nutrient dynamics.
- Differences in the geology of streams (e.g., some areas are P-rich) should be considered when developing DPVs.
- Little evidence is presented that the models are “capable” of doing the tasks required, and there is no way to do uncertainty analysis.

- Given that DPV are being set before the adequacy of upstream criteria has been assessed, can adaptive management be incorporated in the process?
- The document describes, as an example, the model developed for Pensacola Bay. However, the concept calls for approximately 20 of these models to be developed for various systems, which is a major undertaking. Is this even do-able on a statewide basis?

## **J. Summary Recommendations**

**Dr. Meyer** requests each of the lead discussants to summarize key conclusions and recommendations to be included in the response to the charge questions.

### **Charge 1: Conceptual Model**

- Biological endpoints are not well defined. The seagrass endpoint comes close, but there may need to be specific criteria for setting restoration goals; Chl-*a* is a good response variable, but alone may not be protective of seagrasses. For phytoplankton, Chl-*a* is a good measure of biomass, but not a production measure, and doesn't relate very directly to changes in community structure. For balanced fauna, DO is not a good indicator of community structure.
- Concerns about using concentrations vs. loading, and the need to be more explicit about what is being measured. The choice of concentration, rather than loading, requires further justification.
- The 3 conceptual approaches cover a broad range of science-based methods, but appear to be applied differently in the different categories of waters. Additional discussion is needed in the document about the decisions to select particular approaches, and guidance on how to reconcile differences that might arise from different approaches.
- Delineation seems generally appropriate, including the decision to keep South Florida separate.

### **Charge 2: Estuarine Criteria**

- Glad to see EPA is not trying a “one size fits all” approach, but is recognizing different natural condition in different zones. Continue refining the spatial delineation (and consider refinements, e.g., delineation of tidal creeks), and add consideration of temporal variability.
- EPA's emphasis on planktonic chlorophyll is understandable because these data are available and in some estuaries there are clear linkages between Chl-*a*, carbon, and nutrients. The downside in Florida is that there are many shallow estuaries where light reaches the bottom, making benthic diatoms, macroalgae and seagrasses important. Encourage EPA to think more broadly about chlorophyll, including chlorophyll on the bottom, while acknowledging that the best data are for water column chlorophyll.
- Really pleased to see dual-nutrient strategy being employed.
- Phytoplankton “balance” needs to be defined, likely on a biomass-basis rather than in terms of production. However, recognize that biomass provides limited insights into “balanced” phytoplankton and just say that.
- Consider epiphyte abundance (e.g., epiphyte biomass per unit biomass of seagrass) as an additional measure of seagrass health.

- DO can be very low in healthy seagrass beds because of high water temperatures and high levels of nighttime respiration. Discuss the implications of diel hypoxia cycles for a DO criterion. Consider hydrologic variability, including possible increases in occurrence of extreme events.

### **Charge 3: Coastal Criteria**

- General agreement that satellite measures of Chl-*a* are probably the only feasible way to approach coastal criteria, but note that some blooms of nitrogen-fixers (and some HAB) don't relate to excess nutrient loads.
- Concerned that no measures are available for the near-shore region, where satellite Chl-*a* measures have interference. Perhaps turbidity measures could be a help?
- Concern that the approach relies on a surrogate and does not include directly measuring nutrient concentrations. If possible, a first-order estimate of TN and TP loadings to coastal regions would be helpful to determine the strength of the relationship between loadings and Chl<sub>RS</sub>-*a*.
- Definition of the coastal zone based on the 3-mile limit is a problem because it limits the number of calibration samples, and conditions offshore are equally relevant when setting the criteria.
- The arbitrary segmentation of the coastline might be improved by considering that gradients are driven by off-shore transport; bathymetry may be a better basis for deriving segments.

### **Charge 4: South Florida Inland Flowing Waters**

- Question whether sufficient data are available to derive numeric criteria for inland waters, and whether reference conditions are meaningful.
- Reducing nutrients might not be the most effective means of improving biological conditions in the canals.
- The LDI approach intuitively is good, but it was not clear that there is adequate spatial and temporal detail. Important to ground-truth model predictions (spatial and temporal) using monitoring data.
- It seems unrealistic to assume that all of these segment models can be developed in the timeframe available to the Agency. Therefore, EPA needs a "Plan B" or it may end up transferring models outside the areas of calibration, etc.
- The Panel has questions and comments on the 2 statistical methods.
- The canals are unique systems, and any endpoints need to be scaled. Some guidance and examples are available for Netherlands canals.

### **Charge 5: South Florida Marine Waters**

- Recommend that "marine waters" be renamed to coastal and estuarine waters.
- Data seemed appropriate.
- Reconsider recommendation for doing both PCA and cluster analysis.
- Consider historical changes vis a vis the designated uses.
- Reconsider the use of seagrass endpoints and consider the role of salinity in seagrass distributions.

- Clarify whether these criteria would apply to National Park Service management areas.

### **Check on Progress**

Before breaking for lunch, **Dr. Meyer** asked Agency staff if they had comments or concerns for the Panel. **Drs. Behl** and **Thomas** thanked the Panel for the constructive feedback, but reminded the Panel that EPA is charged to develop numeric criteria, including DPV. Dr. Behl noted that the proposal deadline is November 2011, and so the Agency is about to enter the phase of deriving the criteria. EPA is required to use available data and sound science, and agrees with the need to better clarify designate uses, assessment endpoints, to consider tidal creeks and other jurisdictional issues raised by the Panel. She agreed that canals present especially difficult issues, and she welcomed the Panel's insights on how to address those waters, as well as any recommendations on how to set geographic limits for calibration of satellite readings in coastal waters.

After recessing for lunch, the Panel continued with a summary of key points, turning to Charge Question 6.

### **Charge 6: Downstream Protection Values (DPV)**

- The watershed approach is valid, but care is needed in selecting segments to take into account available data and other watershed characteristics (e.g., land use).
- Clarify apportionment, including how to deal with point, nonpoint, (and air?) contributions. Equal apportionment to achieve the estuarine designated uses should be considered illustrative, but equal allocation may not be the most cost-effective way to reach target loadings to the estuary.
- The TMDL process is the place where cost-effectiveness and other issues surrounding load allocation are best addressed.
- Discuss how inland criteria and DPV values would be rectified
- Distinguish between base and peak flow, temporal/seasonal issues.
- LSPC is simplistic and may not adequately characterize transport/transformation of phosphorus.
- Better distinguish natural from anthropogenic sources of nutrients (what is background vs. human impact).
- The continuum between fresh and estuarine waters has implications for changes in nutrient processing.
- Given that it is not possible to assess uncertainty with LSPC model, discuss how uncertainty will be dealt with.
- Provide more information on how canals will be evaluated.

### **K. Next Steps**

**Dr. Meyer** outlined the steps to develop a draft report and letter to the EPA Administrator. She noted that panel members who had been unable to attend this meeting would have an opportunity to comment on the draft and raise issues at the panel's follow-up public teleconference on February 7, 2011. She asked that all comments and written material be provided to the DFO by December 28 so that she and the DFO could prepare a draft document for panel review by mid-January for discussion on the February 7 call. After discussion of next steps, Panel members

worked individually and in small groups to begin drafting written responses to the charge questions.

The meeting was adjourned at 2:30 p.m.

Respectfully Submitted:

/s/

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Stephanie Sanzone,  
Designated Federal Officer  
EPA SAB Staff Office

Certified as Accurate:

/s/

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Dr. Judith Meyer, Chair  
SAB Nutrient Criteria Review Panel

NOTE AND DISCLAIMER: The minutes of this public meeting reflect diverse ideas and suggestions offered by Panel members during the course of deliberations at the meeting. Such ideas, suggestions and deliberations do not necessarily reflect consensus advice from the Panel. The reader is cautioned not to rely on the minutes to represent final, approved, consensus advice and recommendations offered to the Agency. Such advice and recommendations may be found in the final advisories, commentaries, letters or reports prepared and transmitted to the EPA Administrator following the public meetings.

**Attachment A**

**U.S. Environmental Protection Agency  
Science Advisory Board  
Nutrient Criteria Review Panel**

**December 13-14, 2010**

**CHAIR**

**Dr. Judith L. Meyer**, Professor Emeritus, Odum School of Ecology, University of Georgia, Lopez Island, WA

**PANEL MEMBERS**

**Dr. Walter Boynton**, Professor, Chesapeake Biological Laboratory, Center for Environmental Science, University of Maryland, Solomons, MD

**Dr. Deborah Bronk**, Professor, Physical Science Dept, The College of William and Mary, Virginia Institute of Marine Science, Gloucester Point, VA

**Dr. Piers Chapman**, Head of Department, Oceanography, Texas A&M University, College Station, TX

**Dr. Mark David\***, Professor, Natural Resources & Environmental Sciences, University of Illinois, Urbana, IL

**Dr. Robert Diaz**, Professor, Department of Biological Sciences, Virginia Institute of Marine Science, College of William and Mary, Gloucester Pt., VA

**Dr. Anne Giblin**, Senior Scientist, The Ecosystems Center, Marine Biological Laboratory, Woods Hole, MA, United States

**Dr. Kenneth L. Heck, Jr**, Chair, University Programs/Senior Marine Scientist III/Professor, Dauphin Island Sea Lab, Dauphin Island, AL (BY TELEPHONE)

**Dr. Mark Noll**, Associate Professor, Earth Sciences & Special Assistant to the Provost, Academic Affairs, The College at Brockport, State University of New York, Brockport, NY

**Dr. Peter Ortner\***, Research Professor, Marine Biology and Fisheries, Rosenstiel School of Marine and Atmospheric Science, University of Miami, Miami, FL

**Dr. Hans Paerl**, Professor of Marine and Environmental Sciences, Institute of Marine Sciences, University of North Carolina - Chapel Hill, Morehead City, NC

**Dr. Kenneth Reckhow**, Chief Scientist, Global Climate Change and Environmental Sciences, RTI International, Research Triangle Park, NC

**Dr. James Sanders**, Director and Professor, Skidaway Institute of Oceanography, Savannah, GA (BY TELEPHONE)

**Dr. David C. Schneider**, Professor, Ocean Sciences Centre, Memorial University, St. John's, NL, Canada

**Dr. Andrew N. Sharpley**, Research Soil Scientist, Department of Crop, Soil and Environmental Sciences, University of Arkansas, Fayetteville, AR, U.S.A.

**Dr. Andrew Solow**, Associate Scientist, and Center Director, Woods Hole Oceanographic Institution, Woods Hole, MA

**Dr. Alan Steinman**, Director, Annis Water Resources Institute, Grand Valley State University, Muskegon, MI

**Dr. Joseph C. Zieman**, Professor, Environmental Sciences, College and Graduate School for Arts and Sciences, University of Virginia, Charlottesville, VA

#### **SCIENCE ADVISORY BOARD STAFF**

**Ms. Stephanie Sanzone**, Designated Federal Officer, U.S. Environmental Protection Agency, Science Advisory Board (1400R), 1200 Pennsylvania Avenue, NW, Washington, DC, Phone: 202-564-2067, Fax: 202-565-2098, (sanzone.stephanie@epa.gov)

\*Did not participate in the meeting.

## Attachment B

### Nutrient Criteria Review Panel Meeting, December 13-14, 2010 Other Attendees (From Sign-in Sheets)

#### December 13

Janice Alers-Garcia, U.S. EPA  
Betsy Behl, U.S. EPA  
W.H. Benson, U.S. EPA  
Valerie Blank, U.S. EPA  
Jim Carleton, U.S. EPA  
Kevin Carter, SFWMD  
Tiffany Crawford, U.S. EPA  
Steven Davie, Tetra Tech  
Ifeyinwa Davis, U.S. EPA  
Tom DeBusk, DB Env. (by phone)  
Edward Dettmann, U.S. EPA  
Adam Diamond, CF Industries  
Erica Fleisig, U.S. EPA  
Tom Frazer, Univ. Florida  
Treda Grayson, U.S. EPA  
Holly Greening, TBEP  
Jim Hagy, U.S. EPA  
John Heltman, Inside EPA  
John Hochheimer, Tetra Tech  
Chris Hornback, NACWA  
Tony Janicki, Janicki Envr.  
Daryll Joyner, FDEP  
Jim Kaput, FDA/NCTR  
Matt Kastner, The Fertilizer Institute  
Galen Kaufman, U.S. EPA  
Ephraim King, U.S. EPA  
Ashley Lyon NCBA  
Jeanelle Martinez, U.S. EPA  
Doug McLaughlin, NCASI  
Carolina Medina, Soil Sci. Soc. America  
Jacques Oliver, U.S. EPA  
Michael Paul, Tetra Tech  
Steve Peene, ATM  
Chris Pettit, SFWMD  
Garth Redfield, SFWMD

Phil Rosenman, Hall & Associates  
Blake Schaeffer, U.S. EPA  
Jerry Schwartz, AF&PA  
Mario Sengco, AAAS, U.S. EPA  
Bernice Smith, U.S. EPA  
Thomas Teets, SFWMD  
Dana Thomas, U.S. EPA  
Andy Thuman, HydroQual  
Dave Tomasko, PBS & J  
Garrett Wallace, SFWMD  
Brian Watson, Tetra Tech  
Lester Yuan, U.S. EPA

#### December 14, 2010

Janice Alers-Garcia, U.S. EPA  
T. Alexie (?), ASC  
Kevin Carter, SFWMD  
Iffy Davis, U.S. EPA  
Tom Frazer, Univ. Florida  
Jim Hagy, U.S. EPA  
John C. Hall, Hall & Assoc.  
John Heltman, Inside EPA  
Chris Hornback, NACWA  
Tony Janicki, Janicki Env.  
Matt Kastner, The Fertilizer Institute  
Galen Kaufman, U.S. EPA  
Michael Paul, Tetra Tech  
Steve Peene, ATM  
Chris Pettit, SFWMD  
Garth Redfield, SFWMD  
Blake Schaeffer, U.S. EPA  
Dana Thomas, U.S. EPA  
Andy Thuman, HydroQual  
Tim Wool, U.S. EPA  
Lester Yuan, U.S. EPA



## Materials Cited

The following meeting materials are available on the SAB Web site, <http://www.epa.gov/sab>, at the [December 13-14, 2010 Nutrient Criteria Review Panel Meeting](#) page.

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<sup>1</sup> Federal Register Notice Announcing the Meeting (75 FR 66759)

<sup>2</sup> Meeting Agenda, Nutrient Criteria Review Panel, December 13-14, 2010

<sup>3</sup> Charge to the SAB Nutrient Criteria Review Panel

<sup>4</sup> Presentation by Ephraim King on Introduction to Development of Numeric Nutrient Criteria in the State of Florida

<sup>5</sup> List of Registered Speakers for the December 13-14, 2010 Meeting of the Nutrient Criteria Review Panel

<sup>6</sup> Presentation by Holly Greening on EPA's Proposed Approaches for Florida ENC's: Observations from Tampa Bay

<sup>7</sup> Presentation by Thomas Teets and Garth Redfield on behalf of South Florida Water Management District

<sup>8</sup> Presentation by Tom DeBusk on behalf of DB Environmental, Inc.

<sup>9</sup> Comments from Daryll Joyner on behalf of Florida Department of Environmental Protection

<sup>10</sup> Presentation by Tiffany Crawford on the General Approach for Numeric Nutrient Criteria Development in Florida Waters

<sup>11</sup> Presentation by James Hagy, III on Numeric Nutrient Criteria Development for Florida Estuaries

<sup>12</sup> Presentation by Blake Schaeffer on Numeric Criteria Development for Florida Coastal Waters

<sup>13</sup> Presentation by Jacques Oliver on Numeric Nutrient Criteria Development in South Florida Marine and Inland Flowing Waters

<sup>14</sup> Presentation by James Hagy, III on Numeric Nutrient Criteria Development for Protection of Downstream Estuaries